

Building Information Modelling Approach for the Design of a G+7 Residential Tower Using Autodesk Revit

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Abstract

This paper explains how a G+7 residential building was planned, modeled, and structurally detailed using Autodesk Revit. The main goal is to show how Building Information Modelling (BIM) helps make design work more accurate, reduces mistakes, and improves teamwork during construction. The model includes both architectural and structural parts, created according to IS codes. The study shows how BIM makes the whole design process easier—from the first concept to detailed structural analysis—while also improving coordination between different disciplines. Structural components like beams, columns, slabs, and foundations were all created in Revit. The results show that using BIM helps reduce design errors, saves time, and makes construction smoother. Overall, this work supports the idea that BIM is a complete and effective method for modern structural engineering.

Keywords: Architecture Model, Autodesk Revit, Building Information Modelling (BIM), G+7 Building, Residential Building.

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1. INTRODUCTION

Building Information Modelling (BIM) is a digital approach that represents a building’s physical form as well as its functional characteristics within a comprehensive model. It serves as a centralized information system that supports informed decision-making throughout all phases of a project’s lifecycle. The introduction of BIM has transformed traditional construction workflows by bringing greater precision and integration to project development. In contrast to conventional 2D drafting, BIM provides an intelligent 3D environment capable of enhanced visualization, simulation, and collaborative work. Autodesk Revit is a prime BIM platform known for its extensive capabilities in architectural, structural, and MEP modeling.

1.1. AutoCAD

AutoCAD, developed by Autodesk, is a drafting tool used for generating precise 2D plans and 3D visual models across various engineering and design fields. Its user-friendly environment and extensive set of drawing and editing features make it a widely adopted software in technical design disciplines. Revit operates using intelligent building components such as walls, doors, and windows, allowing changes made in one view to automatically reflect in all associated views.

1.2. Revit

Revit is a 3D design software that helps you plan and design buildings more efficiently. It uses real-world building elements like walls, doors, windows, and roofs. These elements are smart, so when you change one thing—like moving a wall—all related drawings such as floor plans, sections, and 3D views update automatically. Architects, engineers, and construction professionals widely use Autodesk's Revit to design and manage building projects.

2. LITERATURE REVIEW

Table 1. Literature Review.

Author(s) & Year	Title/Focus	Methodology/ Approach	Key Findings/ Contributions	Relevance to Current Research
Singh (2019)	The project involved the analysis and design of a G+7 residential building using	The study conducted a comparative analysis between manual calculations per Indian Standard	Software implementation significantly reduced analysis time and improved accuracy while	It provides a foundational comparison between code-based manual methods and software,

	IS codes and structural software.	(IS) codes and software-aided design.	validating compliance with IS codes. The study confirmed the efficiency gains of digital tools over traditional methods.	establishing a benchmark for evaluating efficiency in structural design.
Thareja & Chand (2019)	The study focuses on the effective analysis of high-rise buildings in Autodesk Revit BIM vs. AutoCAD.	This is a comparative case study that analyzes the same high-rise structure using Revit (BIM) and AutoCAD (2D CAD).	Revit BIM enabled integrated 3D modeling, automated documentation, and better error detection, leading to more coordinated and efficient analysis compared to the fragmented 2D AutoCAD process. The project showcased the practical application of Revit BIM in a real-world Indian context. The process facilitated integrated design, improved visualization, and enhanced collaboration among disciplines.	The article highlights the paradigm shift from 2D drafting to 3D modeling, emphasizing BIM's advantages for integration and coordination in complex projects.
Deosarkar et al. (2021)	The project involved the analysis and design of a multi-story residential building in Pune using Revit BIM.	Case study applying Revit BIM for the structural analysis and design of a specific residential building project.	The thesis provided a rigorous framework for comparison. The thesis concluded that BIM enhances collaboration, data management, and lifecycle integration, while conventional tools might be more suitable for specialized structural calculations.	The article provides a practical, recent example of BIM implementation in the Indian construction sector, demonstrating its feasibility for residential projects.
Guyo (2019)	This MSc thesis examines the application of BIM (Revit) compared to conventional software in a high-rise building case study.	This is a detailed methodological case study that compares BIM (Revit) workflows with conventional structural design software (e.g., ETABS, STAAD).		The information is relevant for methodology. The information provides a critical, academic evaluation of the strengths and limitations of BIM in comparison to specialized analytical tools, which in turn informs the tool selection.

3. METHODOLOGY

3.1. Creating a Project

- Before beginning the modeling work in Revit, the architectural plans should be imported from a CAD source.
- Set the units according to your project needs.
- Use grid lines to create the plan view.
- Draw the grid lines using the tools in the Draw panel.
- The Draw panel includes options like line, circle, rectangle, arc, and more.

3.2. Naming and Saving the Project File

- Please choose a name for your project and save the file.
- Saving your file helps prevent losing work due to issues like power failure.
- Click the Application menu.
- Select “Save.”
- Choose the folder where you want to store the file, then give it a clear name so it’s easy to identify later.

3.3. Renaming and Creating Levels

For a multi-story building, you need to create levels as required.

- Go to the Architecture template.
- Select the “Level” option.
- Draw the levels and set the floor height (for example, 10 feet floor-to-floor height).
- Rename all levels, including the ground floor, first floor, and others.
- You can use the Offset option to quickly set the height between levels.
- Each level line has grips at both ends that allow you to adjust the length, and temporary dimensions will appear to help you make changes accurately.

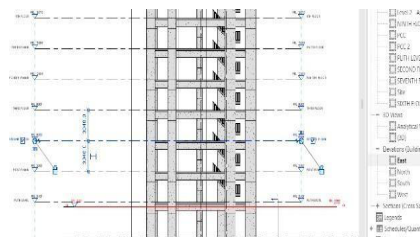


Fig. 1. Adjusting Level Line.

3.4. Components

- The Components panel in Revit contains different categories like doors, windows, gates, railings, beds, furniture, and many other ready-made objects that come installed with Revit Architecture.
- To use these components, click on the Component option, browse through the available items, select what you need, and place it in your model.
- You can place components anywhere you want. If you double-click a component, it opens in a new window where you can edit and customize it. This makes Revit very user-friendly because you can easily modify components to match your design needs.

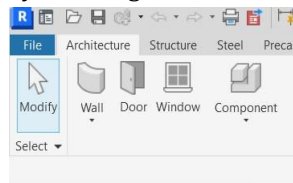


Fig. 2. Component Panel.

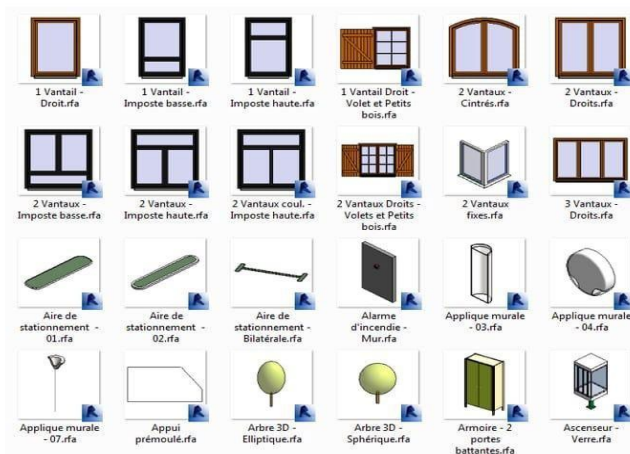


Fig. 3. Available Components.

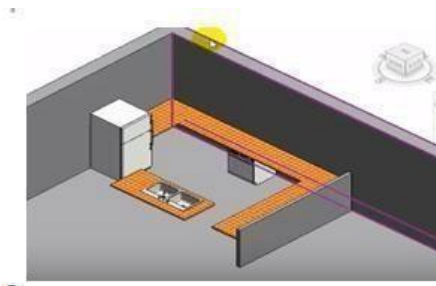


Fig. 4. Components placed in the model.

3.5. Adding Walls

To create the different types of walls, such as

- Generic walls.
- Curtain walls.
- Stacked walls.

3.5.1. Steps

1. Open the Architecture tab from the main toolbar.
2. Choose the Wall option from the wall creation tools.
3. Select “Wall: Architecture” to begin placing walls in the project.
4. Use the Properties palette to browse available wall categories.
5. Pick the desired wall type based on the design requirement.
6. If customization is needed, open the “Edit Type” dialog, duplicate the existing wall, and assign a new name.
7. Modify parameters such as material composition or thickness in the type-editing window.
8. Finally, specify the wall height to match the intended floor level or project standard.

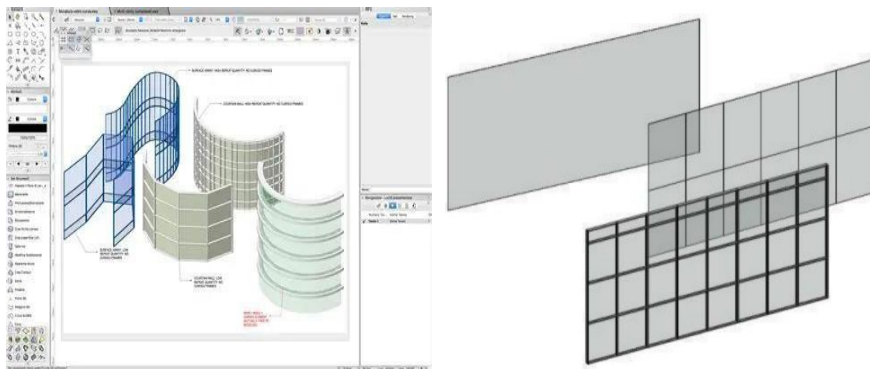


Fig. 5. Types of Curtain Walls.

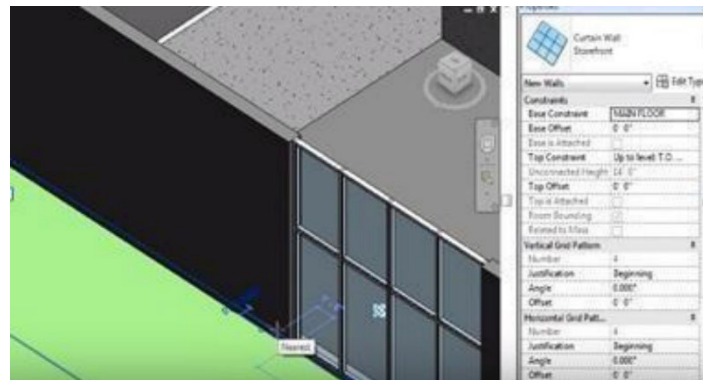


Fig. 6. Combination of curtain wall and generic wall.

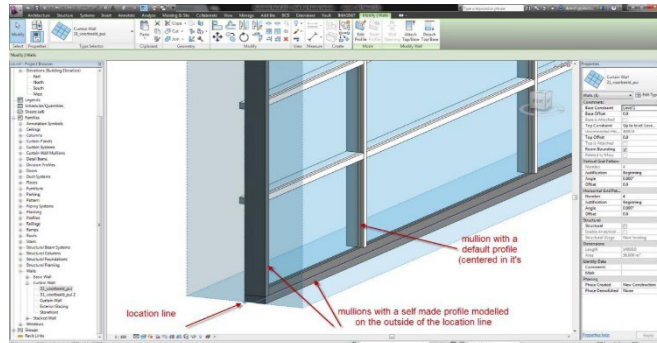


Fig. 7. Curtain Wall With Mullion.

3.6. Adding Roofs

Different roof forms and styles can be created in Revit depending on the project requirements.

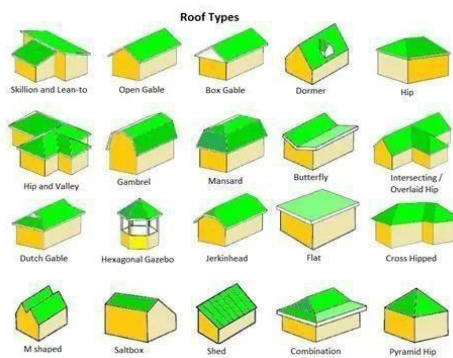


Fig. 8. The various forms and styles of roofs.

3.6.1. Procedure

1. Open the Architecture tab to access the roof creation tools.
2. Choose the Roof command from the available options.
3. Use the drawing tools to sketch the outline of the roof according to the desired shape.
4. Adjust the slope settings in the Properties panel to achieve the required inclination.
5. If a flat roof is needed, simply disable the “Define Slope” parameter for the selected edges.
6. For more complex profiles, the Roof by Extrusion tool can be used, allowing you to create roof shapes by sketching curves such as arcs or lines from an elevation view.

3.7. Adding Floors

Revit offers flexibility to design floors in various shapes based on project needs.



Fig. 9. Revit’s flexibility to design floors.

3.7.1. Procedure

1. Open the desired floor level from the Project Browser to begin creating the floor layout.
2. Go to the Architecture tab and choose the Floor tool.
3. Use the drawing tools to outline the boundary of the floor according to the required design.
4. In the Properties panel, select “Edit Type,” duplicate the existing floor type, and assign a suitable name for the new type.
5. You may then modify parameters such as material and thickness. Floors can also be generated using the Pick Lines option, which allows you to select wall edges to define the boundary automatically.

3.8. Project Details

- Project Name = Construction of a G+7 Residential Building using BIM Software.
- Number of Storeys = 7 Storeys.
- Location = Nelco Society, Ambazari Road, Nagpur.

Table 1. Building Specifications.

Component	Description
Type	Residential Building
Structure	G+7 (8 Floors Total)
Total Height	Approx. 24-28 m
Structural System	RCC Frame Structure
Foundation	Isolated/Combined Footing
Floor Height	10 feet (3.048 meters)

3.9. Schedule Property Box

Procedure for Creating a Door Schedule

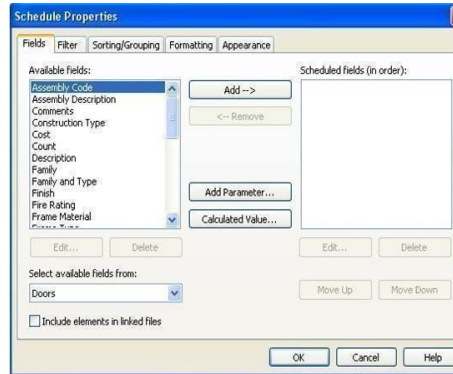


Fig. 10. Door Schedule Property Box.

3.10. Standard Dimensions

Table 2. Standard Door Dimensions.

Door Type	Dimensions
Main Door (MD)	4' X 7'
Bedroom Door (D1)	3' X 7'
Kitchen Door (D2)	3' X 7'
Washroom Door (D3)	2.5' X 7'

Table 3. Standard Window Dimensions.

Window Type	Dimensions
Hall Window (W1)	4' X 4'
Bedroom Window (W2)	3' X 3'
Kitchen Window (W3)	2' X 4'
Washroom Window (W4)	1.5' X 2'

3.11. Views of the Project

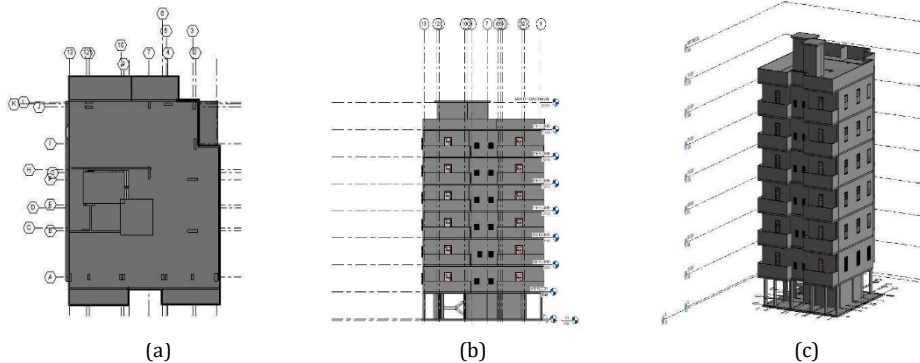


Fig. 11. (a) Top View of Building; (b) Elevation of Building; (c) 3D Model of Building.



Fig. 12. Render View of Project.

4. ADVANTAGES OF USING REVIT

- Reduced design conflicts.
- The system performs automatic schedule generation.
- The system allows for easy modification and revision handling.
- Accurate material estimation.
- Enhanced collaboration and project efficiency.
- Improved visualization and presentation quality.
- Clash Detection: Helps identify conflicts between systems.

5. CONCLUSION

The construction of a G+7 residential building using Autodesk Revit shows how powerful and efficient BIM (Building Information Modelling) is in today's construction industry. By bringing together architectural, structural, and MEP (Mechanical, Electrical, and Plumbing) designs in one digital model, Revit helps create a smooth and coordinated workflow that improves accuracy, saves time, and makes teamwork easier for everyone involved. This project shows realistic 3D modeling of the building and includes accurate families like furniture, lighting fixtures, and other components. It also allows importing models from other software programs, such as AutoCAD. Using Revit, we can even obtain approximate cost estimates of the building. In this project, we completed planning, modeling, and door scheduling and created families for the residential building. The model provides a clear design of the residential building along with well-organized architectural plans. It also contains detailed information about schedules and quantities related to the project. The 3D realistic view helps visualize all the components and families placed inside the building, giving a complete and clear picture of the design.

6. REFERENCES

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